

ABSTRACT OF THE DISCLOSURE

A heavy-duty flame propagation engine has control systems and exhaust aftertreatment systems adapted to provide ultra-low emissions relative to Diesel engines while achieving comparable fuel consumption at reduced emission levels. The control systems include exhaust gas circulation, variable valve actuation, cylinder deactivation, pilot fuel injection, high energy ignition systems and combinations thereof to provide substantially stoichiometric combustion conditions over an entire load range of the engine. In one embodiment, the engine has direct in-cylinder fuel injection, is adapted for lean air-fuel mixture operation, and includes an oxidation catalyst and a lean NOx adsorber.